

## CLAIMS

1. An optical fibre comprising  
a first fibre core, the core being doped and having at least one fibre laser, the at least  
5 one laser comprising a pair of reflection gratings embedded in the first fibre core to form  
a lasing volume  
and a second undoped fibre core separated from the first fibre core by cladding material  
of the optical fibre  
wherein  
10 the second fibre core is optically coupled to the lasing volume of each of the at least one  
fibre laser in the first fibre core.
2. An optical fibre comprising  
a first fibre core, the core being doped and having at least one fibre laser, the at least  
15 one laser comprising a pair of reflection gratings embedded in the first fibre core to form  
a lasing volume  
and a second undoped fibre core separated from the first fibre core by cladding material  
of the optical fibre  
wherein  
20 the second fibre core is optically coupled to the lasing volume of each of the at least one  
fibre laser in the first fibre core such that in use pump light from a pump source can  
propagate down the second fibre core and be coupled into the at least one fibre laser.
3. An optical fibre as claimed in claim 2 wherein each of the at least one laser is  
25 enclosed by an additional pair of reflection gratings arranged in use to reflect pump light  
propagating from the lasing volume of each of the at least one fibre laser in the first fibre  
core.
4. An optical fibre as claimed in any of claims 1 to 3 wherein the second fibre is optically  
30 coupled to the first fibre by one or more long period gratings.
5. An optical fibre as claimed in claim 2 wherein
  - a) the first fibre core contains a plurality of fibre lasers spaced in series along the length  
of the core and
  - 35 b) additional pairs of reflection gratings are located between some or all of the plurality  
of fibre lasers, and

- c) the second fibre core is additionally optically coupled to the regions bounded by each of the additional pairs of reflection gratings.

5 6. An optical fibre as claimed in claim 5 wherein a first set of long period gratings optically couples the second fibre core to the lasing volume of each fibre laser and a second set of long period gratings optically couples the second fibre core to the regions bounded by the additional reflection gratings, the first and second sets of long period gratings being arranged in use to couple different wavelengths of light.

10 7. An optical fibre as claimed in claim 2 wherein

- a) the first fibre core contains a plurality of fibre lasers spaced in series along the length of the core and
- b) each laser is enclosed by a pair of reflection gratings arranged in use to reflect pump light propagating from the lasing volume of each fibre laser back into the lasing volume, and
- 15 c) additional pairs of reflection gratings are located between some or all of the enclosed fibre lasers and
- d) the second fibre core is additionally optically coupled to the regions bounded by each of the additional pairs of reflection gratings.

20

8. An optical fibre as claimed in claims 7 wherein a first set of long period gratings optically couples the second fibre core to the lasing volume of each fibre laser and a second set of long period gratings optically couples the second fibre core to the regions bounded by the additional reflection gratings, the first and second sets of long period gratings being arranged in use to couple different wavelengths of light.

25

9. An optical fibre as claimed in claims 1 or 2 wherein the optical fibre is tapered along its length.

30 10. An optical fibre as claimed in any preceding claim wherein the optical fibre comprises a further third fibre core, the third fibre core being optically coupled to the at least one laser of the first fibre core and separated from the first and second fibre cores by cladding material of the optical fibre.

35 11. A sensor system characterised by an optical fibre according to any preceding claim.

10

12. A sensor system comprising an optical fibre according to any of claims 1 – 10, a pump source operably connected to the second fibre core of the optical fibre and detection means arranged to detect and analyse light emitted from the optical fibre.